

# ESA-146 Public Report

## Introduction:

Shaw Industries, Plant 20 in Dalton, GA receives and tufts yarn. It is then dyed via one of two different processes, either a continuous atmospheric dye range or a batch mode pressurized vat or “beck.” Three steam boilers are used to supply a single header, two fired by No. 6 oil and the other by natural gas.

## Objective of ESA:

To provide technical assistance targeted to reduce fuel expenditures.

## Focus of Assessment:

The focus was to build a representative SSAT model for the plant and then assess viable savings options. Because the plant had a single pressure header and was generally a smaller steam operation it was possible to individually model each boiler and the associated portion of steam each provided. The plant site lead had collected much input information in advance as well as completed the SSST prior to the visit; therefore, attention could be especially focused on a number of opportunities for each (and all) of the boilers and their demands.

## Approach for ESA:

Plant personnel felt confident of the average proportions of boiler outputs. The three boilers are kept firing generally in a 2/2/1 proportion of capacity percentages because of large production steam demand swings and little possible planning for it. The seven identified opportunities for savings fell into two categories – those affecting the collective steam system (3 items) and those affecting the efficiency of each boiler individually (4 items). Savings from items resulting in collective savings were applied to the three boilers in proportion to their existing average outputs, whether firing No. 6 oil or natural gas as this gave the most realistic measure of savings, even though natural gas was the impact fuel and plant goals definitely include the reduction and eventual elimination of use of the natural gas-fired boiler.

## General Observations of Potential Opportunities:

Total 2005 natural gas use was 391,486 MMBtu (including 201,146 MMBtu for non-steam processes as driers) and 404,878 MMBtu for No. 6 use. Impact fuel considered to be natural gas at \$9.35/MMBtu, but with No. 6 oil at \$1.20/gal. (The above based on HHV's of 1,030Btu/MCF and 150,000Btu/gal for natural gas and No. 6 oil, respectively.) The (non)impact electrical cost was \$0.045/kWh.

The optimization of boiler sequencing meant that instead of running the three boilers at approximately a 50%, 50%, 25% fixed proportion average a controller would first load the most efficient (No. 6) boiler, then the less efficient (No. 6 boiler) and only then, lastly, the natural gas-fired boiler. This resulted in alternative fuel use (less natural gas and more No. 6) associated with higher steam generation efficiencies. (Please see DOE Best Practices Steam Energy Tip #16.)

The waste water heat exchanger captures energy which was being wasted and heats water which was previously being heated by steam sparging, but all within a vessel (all steam energy utilized).

Since projected gains on the above would only reach 108F water a “direct-contact” hot water heater unit was proposed to go from that point to the required 140F temperature. This would mean a net increase of natural gas (at a higher efficiency) and less use of No.6 use.

Oxygen trim was proposed on two boilers and a stack economizer on two. One of these boilers was the same one, and savings were taken such that the trim was installed first followed by the (incremental only) savings estimate for that economizer.

Plant personnel were quite cognizant and aware of the implementation costs of these possible projects. They are listed above in the order of increasing simple payback. Further study and costing will be necessary on many of the projects listed, but, based on closing meeting discussion, it might be anticipated that the list might be categorized (by Near, Medium and Long term, as requested) as above in the table and again below:

Near Term – Boiler Sequencing, Waste Water Heat Exchanger and Oxygen Trim on Boiler 3.

Medium Term - Economizer on Boiler 3.

Long Term – Hot Water Heater, Economizer on Boiler 1 and, improbably, Oxygen Trim on Boiler 2.

The requested % plant natural gas (only) savings for the above are as follows, but please refer to more comprehensive information for overall results:

Near Term – \$1,502,307 (41.0%), 150,205MMBtu (38.4%)

Medium Term – \$ 0 (0%), 0 MMBtu (0%)  
Long Term – (\$ 308,365.) (-8.4%), (33,636MMBtu (-8.6%))

**Management Support and Comments:**

Plant and corporate personnel were uncommonly prepared for this ESA and results seemed to confirm some projects that were already being considered as well as bring some others to the forefront for consideration and implementation. The closing meeting with the plant manager appears to have culminated in a consensus that near term opportunities would shortly be funded and implemented, and that medium term ones would soon follow with longer term ones to be assessed further due in part due to their savings being follow-ons and interdependent with the earlier ones.

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